

What is claimed is:

1. An improved desalination process to produce potable water which comprises:

(a) passing a first stream of salt water containing a high concentration of hardness ions through an ion selective membrane to form a softened salt water having a reduced content of hardness ions;

(b) blending the softened salt water with a second stream of untreated salt water containing a high concentration of hardness ions to form a feed to a desalination system;

(c) introducing the feed to the desalination system to form a water product of potable quality, wherein the improvement comprises the introduction of a feed of variable proportions of softened and untreated salt water to the desalination system to increase the top operating temperature of the system and increase recovery of potable water.

2. The desalination process according to claim 1, wherein the softened salt water content of the feed is at least 5%.

3. The desalination process according to claim 1, wherein the feed is passed through at least one desalination system selected from the group consisting of reverse osmosis, multistage flash distillation, multieffect distillation and vapor compression distillation.

4. The desalination process according to claim 3, wherein the desalination system is thermal driven and selected from the group consisting of multistage flash distillation and multieffect distillation.

5. The desalination process according to claim 3, wherein the desalination system is electric driven and selected from the group consisting of reverse osmosis and vapor compression distillation.

6. The desalination process according to claim 3, wherein the desalination system is multistage flash distillation.

7. The desalination process according to claim 6, wherein the multistage flash distillation system is operated at a temperature of 95-180°C.

8. The desalination process according to claim 1 or 6, wherein the ion selective membrane is a nanofiltration membrane.

9. The desalination process according to claim 8, wherein the first stream of salt water is subjected to a deaeration pre-treatment step after passing through a softening system comprised of one or more nanofiltration membranes.

5

10. The desalination process according to claim 9, wherein the first stream of salt water is pre-heated by the heat of a reject stream of the desalination system before deaeration.

11. The desalination process according to any one of claims 1 or 4-7, wherein the ion selective membrane is operated at a variable pressure of 5-80 bar.

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12. The desalination process according to claim 11, wherein the ionic content and quantity of softened salt water varies with the operating pressure of the ion selective membrane.

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13. The desalination process according to claim 1, wherein the softened salt water is stored in a buffer system.

14. The desalination process according to claim 13, wherein the softened salt water stored in the buffer system is blended with the second stream of untreated salt water to form the feed to the desalination system.

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15. The desalination process according to claim 13, wherein the softened salt water stored in the buffer system is injected into the desalination system.

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16. The desalination process according to claim 1, wherein the softened salt water is fed by a cluster system to two or more desalination systems and blended with the second seawater stream of each system.

17. The desalination process according to claim 1, wherein the desalination system produces brine containing water selected from the group consisting of reject, blowdown and recycled brine which is partially subjected to a nanofiltration step and recycled through the desalination system.

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18. The desalination process according to claim 1, wherein a stoichiometric amount of acid is added to the first stream before that stream passes through the ion selective membrane.

19. An improved desalination process to produce potable water which comprises:

(a) passing a first stream of salt water containing a high concentration of hardness ions through an ion selective membrane to form a softened salt water product having a reduced content of hardness ions, wherein the ion selective membrane is operated at variable pressure as a function of the cost of electricity;

(b) blending the softened salt water with a second stream of untreated salt water containing a high concentration of hardness ions from a buffer system to form a feed to a desalination system;

(c) introducing the feed from the buffer system to the desalination system to form a water product of potable quality,

wherein the improvement comprises the operation of the ion selective membrane at a variable pressure as a function of the cost of electricity to form the softened salt water that is blended in variable proportions, to increase the top operating temperature of the desalination system and increase recovery of potable water, with the untreated salt water.

20. The desalination process according to claim 19, wherein the feed is passed through at least one desalination system selected from the group consisting of reverse osmosis, multistage flash distillation, multieffect distillation and vapor compression distillation.

21. The desalination process according to claim 19, wherein the ion selective membrane comprises a nanofiltration membrane softening system.

22. The desalination process according to claim 21, wherein the ion selective membrane is operated at a variable pressure of 5-80 bar.

23. The desalination process according to claim 19 and 22, wherein the ionic content and quantity of softened salt water varies with the operating pressure of the ion selective membrane.

24. An improved desalination process which comprises:

(a) blending a first stream of softened salt water having a substantially reduced concentration of hardness ions with a second stream of untreated salt water containing a high concentration of hardness ions to form a feed to a desalination system, and

(b) passing the feed through the desalination system to form a water product of potable quality,

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wherein the improvement comprises the introduction of a feed of variable proportions of softened and untreated salt water to the desalination system to increase the top operating temperature of the system and increase recovery of potable water.

- 5 25. The desalination process of claim 24, wherein the stream of softened salt water is obtained by passing untreated salt water across an ion selective membrane to reduce the ionic content of the first stream.

- Sub A2 10 26. The desalination process of claim 24, wherein the stream of softened salt water is brine containing water produced by the desalination system, and wherein the brine containing water is selected from the group consisting of reject, blowdown and recycled brine.

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